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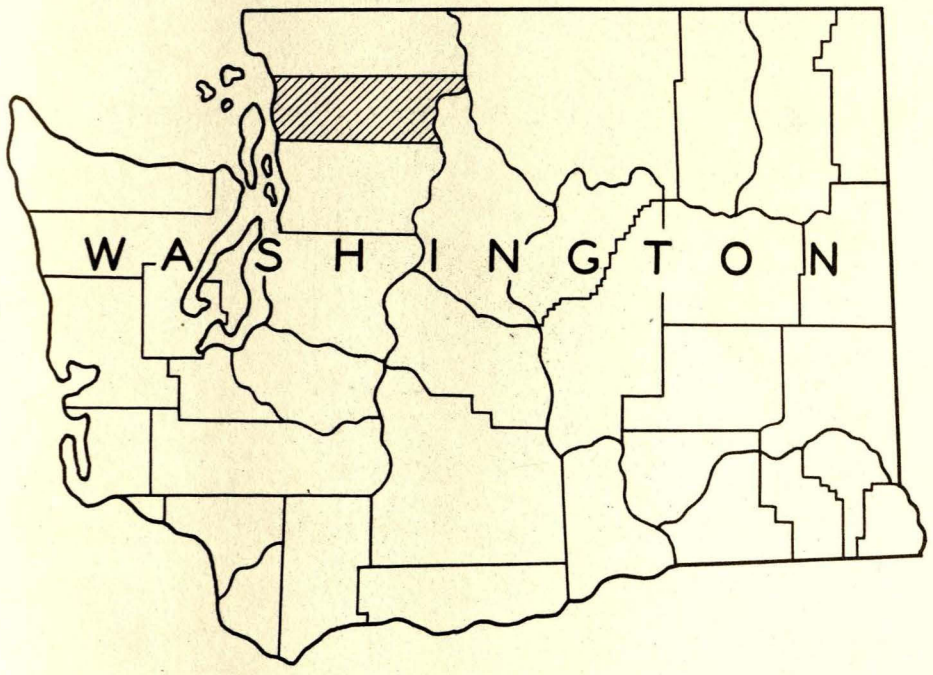
FOREST STATISTICS
FOR
SKAGIT COUNTY, WASHINGTON

FROM THE FOREST SURVEY INVENTORY REVISED IN 1941

FOREST SURVEY REPORT NO. 88



U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE
PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION
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R.W. COWLIN, IN CHARGE OF FOREST SURVEY F. L. MORAVETS, ASSISTANT

PORTLAND, OREGON

AUGUST 1942

FIGURE 1

OUTLINE MAP OF SKAGIT COUNTY, WASHINGTON
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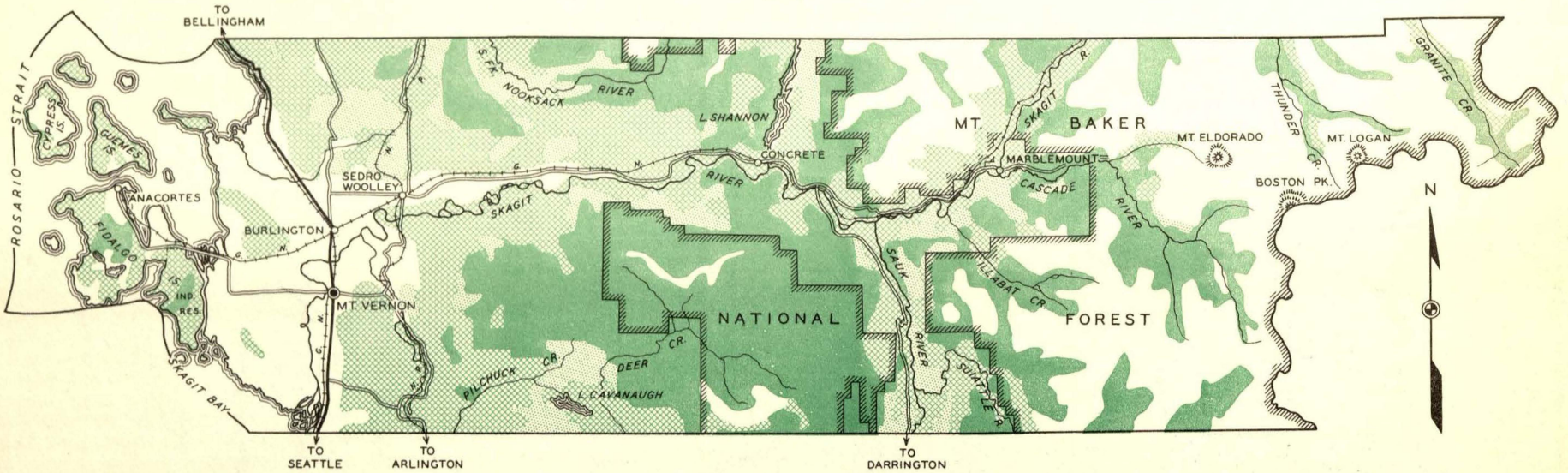

SCALE
0 5 10 15 MILES

LEGEND

- SAW TIMBER
- SECOND GROWTH
- DEFORESTED CUTOVERS AND BURNS
- NONCOMMERCIAL FORESTS AND NON-FOREST LAND

FOREWORD

The forest survey, a Nation-wide project, consists of a detailed investigation in five major parts of present and future forest resources: (1) An inventory of the country's existing forest resources in terms of areas occupied by forest-cover types and of timber volumes, by species, in board feet and cubic feet, and a study of conditions on cut-over and on burned forest lands; (2) a study of the depletion of the forests through cutting and through loss from fire, insects, disease, and other causes; (3) a determination of the current and potential growth on forest areas; (4) an investigation of present and prospective requirements of the United States for forest products; and (5) an analysis and correlation with other economic data of findings of these studies in order to make available basic facts and guiding principles necessary to plan for sound management and use of forest resources.

The forest survey of Oregon and Washington, an activity of the Pacific Northwest Forest and Range Experiment Station, was conducted in the Douglas-fir region during the period 1930-33, inclusive.* In 1937 work of keeping the survey up to date was commenced in counties in which there had been extensive depletion since the original survey.

The original inventory of the forests of Skagit County, Washington, was made in 1932 and a report summarizing statistics on timber volume, forest type area, and productive capacity of the forest land was issued in 1934. In the summer of 1941 a reinventory involving field examinations and recompilation of statistical data was made. In the field areas cut over during the decade 1920-29, areas cut prior to 1920 that were non-restocked at the time of the original inventory, and burned areas were examined to determine the condition of regeneration. Location and extent of cut-over areas logged since January 1, 1930, as reported by cut-over records, were checked, and areas recently cleared for agricultural use were noted. The ownership status of all lands was also brought up to date.

Results of the reinventory are given in this report which supersedes the one issued in 1934.

* Oregon and Washington were divided for survey purposes into two regions, (1) Douglas-fir region, consisting of that part of both States west of the Cascade Range summit, and (2) ponderosa pine region, that part of both States east of the Cascade Range summit. A regional report which includes an interpretation of the forest survey data and analysis of the forest situation in the Douglas-fir region has been published and a similar report for the ponderosa pine region is now in the process of being published. Each region was divided into units--11 in the Douglas-fir region and 7 in the ponderosa pine region--for the purpose of more intensive analysis of data. It is planned to issue reports presenting findings for each unit.

FOREST STATISTICS FOR SKAGIT COUNTY, WASHINGTON

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FOREST STATISTICS FOR SKAGIT COUNTY, WASHINGTON[1/]

By F. L. Moravets[2/]

Today the people of Skagit County, Washington, enjoy the fruits of a diversified economy--one that has developed from the utilization of several natural resources--which if wisely managed can be kept permanently fruitful.

As a resource base, nature endowed the area of one and one-tenth million acres within the exterior boundaries of the county with vast forests of merchantable timber, unusually fertile arable lands, potential energy in rushing rivers, off-shore fisheries, mineral deposits, numerous and varied wildlife, and a rugged scenic mountainous region of great inspirational and recreational value.

The present economic and social structure of the county has resulted from the utilization of all of these resources, some to a greater degree than others. The forests and arable lands have been of major importance, the other resources of somewhat lesser importance.

This report, through an analysis of the statistical data obtained in an inventory of the forests of the county, will attempt to point out the role taken by the forests.

Physiography of the County

The physiography of Skagit County is extremely varied. Reaching from the shore of Puget Sound to the crest of the Cascade Range some 95 miles eastward, its surface climbs from the level LaConner tide flats and wide deltas of the Skagit and Samish Rivers at sea level to the 9080-foot peak of Mt. Logan on the jagged crest of the Cascades (figure 1). Between these extremes lies a roughly broken topography composed of river bottoms, gently rolling foothills, level benchlands, narrow deeply cut canyons, and numerous mountainous spurs of varying height and extent. The Skagit River, which has its most distant headwaters in Canada some 50 miles to the north, enters the county to roughly split it in half east and west. Several tributaries of the Skagit, chiefly the Sauk, Cascade, and Baker Rivers, complete the main drainage system. The South

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1/ Assistance in the compilation of the data contained in this report was furnished by the personnel of Work Projects Administration official project 65-2-94-144.

2/ Field work of the revised inventory of the county's forests was done by Edward D. Buell; compilation of data was done by W. H. Schwindel.

Fork Nooksack River heads in the north-central portion of the county and drains a small area before flowing northward into Whatcom County. Several islands that lie to the west of the mainland have a combined area of about 40,000 acres. Fidalgo Island is the largest; Guemes, Cypress, and Sinclair Islands are others of considerable extent.

Climatic conditions vary much in the same manner as the topography. The low-lying western portion of the county bordering on Puget Sound has equable temperatures throughout the year with no extremes of heat or cold. This portion is also in the so-called dry belt of northwestern Washington, an area lying in the lee of the Olympic Mountains and thus protected from the heavily moisture-laden clouds that sweep in from the Pacific Ocean. The town of Anacortes, on Fidalgo Island, has an average annual rainfall of about 24 inches, whereas at Concrete, some 50 miles eastward and near the center of the county, the average is about 60 inches and, although climatological data are not available, the high rugged Cascades of the eastern portion have an average annual precipitation considerably over 100 inches, a large part of which falls as snow.

In an area of such varied topographic and climatic conditions, the natural vegetative cover is likewise diversified. The original forest cover of Skagit County may be said to have occupied roughly three zones: the first, generally below an elevation of 2,000 to 2,500 feet and in which physical conditions favored the growth of Douglas-fir and western redcedar; the second, from 2,500 to slightly above 4,000 feet elevation where conditions were favorable for western hemlock, Pacific silver fir, Alaska yellow-cedar, and western white pine; and the third, which may be called the subalpine timber zone, where climatic conditions prohibit tree growth of merchantable size and quality.

The Original Forests

The extent of the forests of Skagit County at the advent of white settlement is unknown but it is probable that the only non-forested areas of appreciable extent were the delta lands built up by silt deposits of the Skagit and Samish Rivers, tide flats, barrens above timberline, and mountain meadows. It is estimated that the original forests covered in the neighborhood of 930,000 acres or about 84 percent of the county's total land area of 1,108,305 acres. Area statistics on present stands and deforested lands indicate that probably 650,000 acres, or 70 percent of the original forested area, was stocked with conifer timber of merchantable size and quality, judged by present utilization standards. Approximately one-third of the remaining forested area was stocked with immature conifer stands, and two-thirds by timber of noncommercial character. The volume of merchantable timber was probably near 25 billion board feet.

It is estimated that before logging began, old-growth stands in which Douglas-fir of large size comprised the bulk of the volume covered approximately 260,000 acres. Stands in which western redcedar formed the major portion of the volume occupied an additional 70,000 acres. These two types, which together accounted for roughly one-half of the original saw-timber area, occurred principally in the western half of the county. Here, they clothed the foothills, lower slopes, and benchlands below the 2,000- to 2,500-foot elevation; on the large islands they occupied the more sheltered situations. Stands in these types were generally even-aged and from 300 to 600 years old. In the Douglas-fir type, western redcedar was a common associate; Sitka spruce was an associate at lower elevations along stream courses; and western hemlock frequently comprised a considerable portion of the volume, especially towards the upper limit of the type's occurrence. The western redcedar type was always a mixed stand in which Douglas-fir was an associate at the lower levels and western hemlock and occasionally silver fir at the upper levels.

Mature Douglas-fir in these two types varied from 40 to 100 inches in diameter breast height, was from 6 to 14 merchantable 16-foot logs in height, contained only a small amount of defect, and was of the highly marketable quality known as "yellow fir" by the industry. The cedar timber was of comparable size, sometimes of greater diameter but shorter in length, and of good quality.

The original forest contained Douglas-fir stands other than those of the large old-growth type. Some 20 thousand acres principally in the eastern portion of the county was stocked with a small old-growth type of timber averaging less than 40 inches in diameter. These stands occurred at slightly higher elevations than the large type and in general on less favorable sites. Thrifty second-growth stands of Douglas-fir of merchantable size but under about 150 years of age, which had restocked burns, probably covered an additional 30 thousand acres.

Above the Douglas-fir and western redcedar types and extending up to the subalpine timber zone, extensive stands of western hemlock and upper-slope mixtures covered the upper slopes, benches, and ridges. These stands were usually composed of various mixtures in which either western hemlock or silver fir was the key tree. Common associates were Alaska yellow-cedar and western white pine. Near the subalpine zone mountain hemlock and alpine fir frequently formed part of the stand.

The Present Forests

After considerably more than a half century of lumbering and land-clearing operations, what is the extent and character of the county's forests today? In the forest survey the forest cover was classified as to type and the extent of each type mapped in the field. Results of this classification and area determination are shown in table 1. 3/

3/ One-inch-to-the-mile county type maps and 1/4-inch-to-the-mile lithographed State type maps have been prepared to show the location and extent of the forest types. For information address Director, Pacific Northwest Forest and Range Experiment Station, 423 U. S. Court House, Portland, Ore.

Table 1. - Area, in acres, of all forest cover types, by ownership class
Data corrected to September 1, 1941

Type No.	Type	Private	State		County	Municipal	Indian	Federal, available		Total
			Available	Reserved				National forest	Public domain	
	Douglas-fir									
6	Large old growth	19,370	1,740	440	715	1,105	230	5,565	40	29,205
7	Small old growth	2,470	110		360	65	20	8,215		11,240
8	Large second growth	21,400	5,120	155	2,060	60	1,355	6,790	50	36,990
9	Small second growth	45,710	9,035	125	5,235	880	3,465	22,165	180	86,795
10	Seedlings and saplings	39,235	25,305		21,725	170	490	6,230	40	93,195
11	Sitka spruce, large	20						725		745
	Western hemlock									
14	Large	36,925	11,530		1,215			76,810	80	126,560
15	Small	6,565	4,140		790		70	2,405	335	14,305
16	Seedlings and saplings	8,790	13,435		5,320		40	2,050	10	29,645
	Western redcedar									
17	Large	24,645	6,000		450	15	170	14,880	10	46,170
19	Small	4,970	690		595					6,255
	Fir-mountain hemlock									
23	Large	20,920	3,490		1,140			76,125		101,675
24	Small	515	710		70			2,400		3,695
26	Lodgepole pine, small	45					15	1,390		1,450
30	Grand fir, second growth	425	10							435
	Hardwood									
31.5	Large	16,765	915		885		1,055	80		19,700
31	Small	20,975	2,505	10	2,470	80	855	185		27,080
33	Subalpine	1,985	1,075		620			148,465		152,145
	Nonrestocked cut-over									
35	Cut prior to 1920	10,415	1,130		1,260	175			40	13,020
35A	Cut from 1920-29, incl.	6,325	1,955		1,275		65	65		9,685
36	Recent cut-over, since 1930	42,100	5,420		2,080	75	175	205	10	50,065
37	Deforested burn	430	170				15	2,965		3,580
38	Noncommercial rocky area	5,165	165	330	1,470	235	40	12,450	190	20,045
	Total forest types	336,165	94,650	1,060	49,735	2,860	8,060	390,165	985	883,680
	Nonforest land									
3	In agricultural use	111,060	1,385	25	375	120	655	135	375	114,130
2	Other	7,660	470	50	390	275	5	101,625	20	110,495
	Total	454,885	96,505	1,135	50,500	3,255	8,720	491,925	1,380	1,108,305

The present total area of forest land given in the table is slightly under 884,000 acres, a figure some 46,000 acres less than the estimated area of the original forest land, a decrease of about 5 percent. This decrease, which represents the acreage cleared for agriculture use, is relatively small and should cause no great concern regarding depletion of the forest resource. Furthermore, the cleared land was put to productive use.

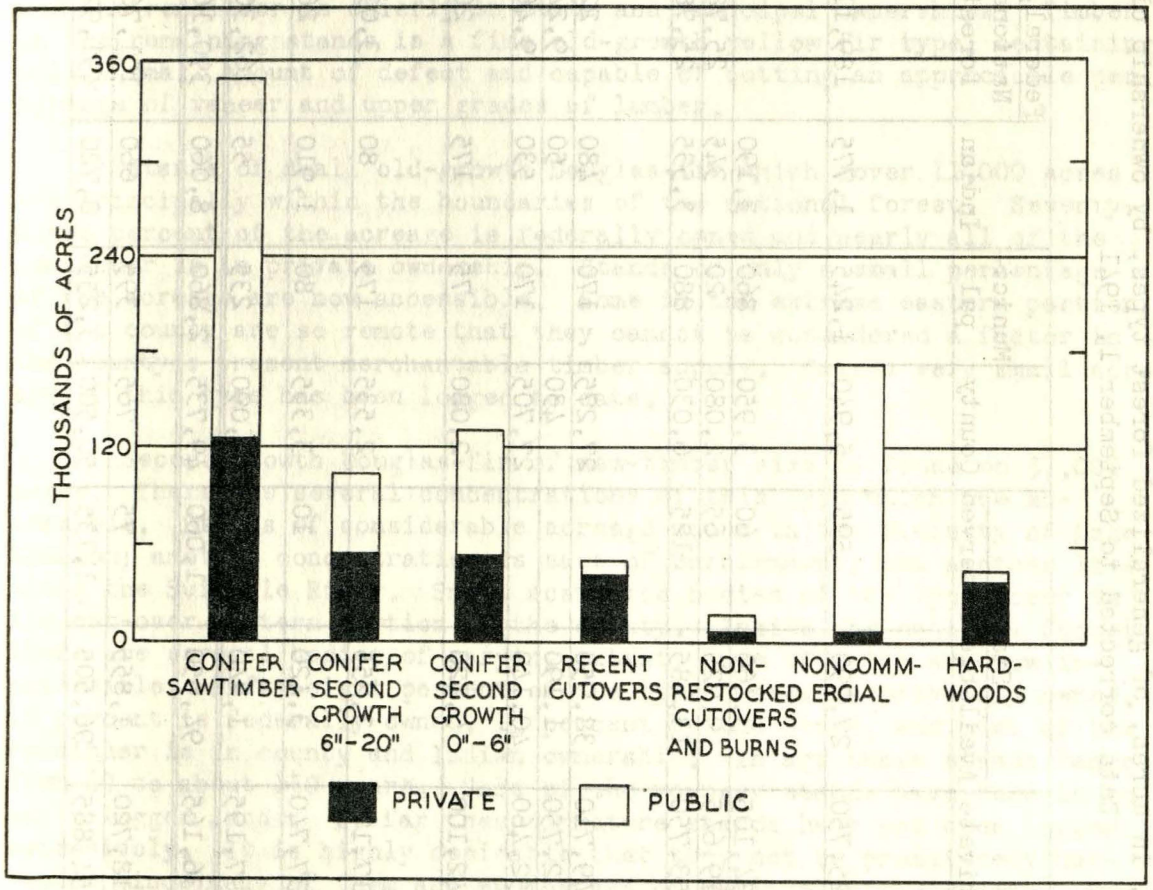

Figure 2. Generalized forest types by ownership class (from table 2).

Cut of Douglas-fir saw timber large. However, further study of the table discloses a large-scale reduction in the area of some of the saw-timber stands, particularly large old-growth Douglas-fir (classified as type 6). Stands of this type, estimated to have covered approximately 260,000 acres in the original forest, now occupy but 29,000 acres. The area of western redcedar stands (type 17), originally estimated at 70,000 acres, now totals 46,000 acres. Considering all of the saw-timber types, it is seen in table 2, which shows the types in generalized groups, that their present total area is 353,000 acres, a reduction of nearly 47 percent from the original 650,000 acres. Figure 2 shows graphically the relative acreages of the generalized types.

Table 2. - Area, in acres, of generalized forest types, by ownership class
Data corrected to September 1, 1941

Type	Private	State		County	Municipal	Indian	Federal, available		Total
		Available	Reserved				National forest	Public domain	
Conifer saw timber Types 6, 7, 8, 11, 14, 17, & 23	125,750	27,990	595	5,940	1,245	1,775	189,110	180	352,585
Conifer second growth Types 9, 15, 19, 24, & 30									
On cut-over areas	34,105	3,460	60	3,950	860	3,190		35	45,660
On old burns	19,645	9,725	65	2,080	20	345	25,785	480	58,145
Total	53,750	13,185	125	6,030	880	3,535	25,785	515	103,805
Conifer seedlings and saplings Types 10, 16, 19, 24, & 30									
On cut-over areas	49,710	38,950		27,275	170	480	225	50	116,860
On old burns	2,750	1,190		430		50	9,240		13,660
Total	52,460	40,140		27,705	170	530	9,465	50	130,520
Recent cut-over areas Type 36	42,100	5,420		2,080	75	175	205	10	50,065
Nonrestocked cut-over and burned areas Types 35, 35A, and 37	17,170	3,255		2,535	175	80	3,030	40	26,285
Hardwoods Types 31 and 31.5	37,740	3,420	10	3,355	80	1,910	265		46,780
Noncommercial areas Types 26, 33, and 38	7,195	1,240	330	2,090	235	55	162,305	190	173,640
Total forest types	336,165	94,650	1,060	49,735	2,860	8,060	390,165	985	883,680
Nonforest land Types 2 and 3	118,720	1,855	75	765	395	660	101,760	395	224,625
Total	454,885	96,505	1,135	50,500	3,255	8,720	491,925	1,380	1,108,305

Old-growth Douglas-fir stands readily accessible, on favorable ground, and composed of timber of the highest marketability, have borne the brunt of the several decades of logging operations. Only small scattered bodies of this type remain, none of which exceed 3,000 acres in area. Practically all of these can be reached by reasonable extensions of existing transportation facilities and it is probable that many of them will be cut during the present wartime demand for logs. Approximately 19,000 acres, or 66 percent of the type's area, is in private ownership; 19 percent is federally owned in the Mt. Baker National Forest; and the remainder is chiefly in State and municipal ownerships. Timber in the remaining stands is a fine old-growth yellow fir type, containing only a small amount of defect and capable of cutting an appreciable percentage of veneer and upper grades of lumber.

Stands of small old-growth Douglas-fir which cover 11,000 acres are principally within the boundaries of the national forest. Seventy-three percent of the acreage is federally owned and nearly all of the remainder is in private ownership. Stands on only a small percentage of the acreage are now accessible. Some in the extreme eastern portion of the county are so remote that they cannot be considered a factor in the county's present merchantable timber supply. Only a very small acreage of this type has been logged to date.

Second-growth Douglas-fir of saw-timber size is found on 37,000 acres. There are several concentrations of this type which are accessible. Stands of considerable acreage occur in the vicinity of Lake Shannon; another concentration is east of Marblemount; and another lies along the Suiattle River. Small scattered bodies of the type occur in the cut-over western portion of the county. Inside the national forest there are several bodies of varying extent, some of which are now inaccessible. Fifty-eight percent of the type's area is privately owned, 18 percent is federally owned, 14 percent by the State, and most of the remainder is in county and Indian ownership. In age these stands range from 60 to about 150 years. Some of the younger stands have come in on early logged lands. So far these immature stands have not been logged extensively. It is highly desirable that they not be prematurely harvested since many of them are at the age of maximum volume growth. However, if material from some of these stands is needed for the war market, it is to be hoped that a form of selective logging which removes only a relatively small portion of the stand and leaves the remainder in a productive condition will be employed.

Saw-timber stands other than those in which Douglas-fir predominates include 127,000 acres of western hemlock type, 46,000 acres of western redcedar type, and 102,000 acres of fir-mountain hemlock type. Stands in which Sitka spruce comprises more than 50 percent of the volume stock less than a thousand acres.

One large body of saw timber remains. In the south-central portion of the county there is a rugged mountainous region some 25 miles

in length, 6 to 14 miles in width, and covering 150,000 acres which contains the major portion of the hemlock and cedar types and nearly half of the fir-mountain hemlock type. With the exception of two chains of ridges which extend above the zone of merchantable tree growth, the region is solidly stocked with saw-timber stands. The cedar type occupies the lower elevations along the main drainages of the region--Deer and Pilchuck Creeks which flow to the southwest, Day Creek to the northwest, and Finney Creek to the northeast. Stands in which hemlock is the key tree cover the slopes, and the ridges are covered with the fir-mountain hemlock type in which silver fir comprises the major part of the volume. In point of distance this body of saw timber is accessible as no part is more than 7 miles air line from truck roads or railroad spurs. However, the topography over a considerable part of the region is rugged. Logging operations are gradually reducing this body of timber as they move in from the southwest, west, north, and northeast. The cedar is of good quality suitable for lumber or shingles and the hemlock and silver fir comprise a large supply of pulpwood. There is also considerable Douglas-fir volume principally in the cedar type. Approximately three-fifths of this body of saw timber is within the boundaries of the Finney Creek section of the Mt. Baker National Forest.

Smaller bodies of merchantable hemlock and cedar types lie in the drainages of the South Fork Nooksack, Baker, and Cascade Rivers and smaller streams. The fir-mountain hemlock type clothes most of the upper slopes and ridges lying below the subalpine timber zone particularly within the national forest. Many of these scattered bodies are now inaccessible.

Taken as a whole, ownership of the 353,000 acres of saw-timber stands in the county is divided as follows: private 36 percent, federal 53 percent, State of Washington 8 percent, and the remainder in county, Indian, and municipal ownership classes.

Acreage of restocked cut-over land increasing. What is the present condition of the 297,000 acres estimated to have been cut over in the county? The answer to this question is to be had in part in table 2. Here the acreage of conifer second growth and conifer seedlings and saplings on cut-over areas is shown as approximately 46,000 acres and 117,000 acres respectively. In addition, some 5,000 acres of second-growth stands that have reached saw-timber size (type 8) occupy early logged lands. Conifer second-growth stands have, therefore, restocked a total of 168,000 acres or roughly 57 percent of the lands cut to date. Further analysis of the statistics show 50,000 acres cut since the beginning of 1930, classified in the reinventory as recent cut-over areas, on which condition of regeneration was not determined since there had been on the whole insufficient time for seedlings to become established; 13,000 acres cut prior to 1920 still nonrestocked; and 10,000 acres cut during the decade 1920-29 also nonrestocked. Combined, the recent cut-over and the nonrestocked older cut-over lands amount to 73,000 acres, or nearly 25 percent of the total cut-over area. Land cleared for agriculture is estimated at 46,000

acres, about 15 percent of the total; the remainder of the cut-over area, some 7,000 acres, is restocked with hardwoods.

On a whole, the record of regeneration of cut-over lands in Skagit County is encouraging, particularly when it is compared to the records in most of the other counties in the Douglas-fir region in which there have been large-scale lumbering operations. The acreage of restocked lands is large and the acreage of nonrestocked lands relatively small. At the time of the original inventory in 1932 there was a total of 25,000 acres, cut prior to 1920, nonrestocked; nearly half of this area had restocked by 1941. Of the 67,000 acres estimated to have been cut in the 10-year period 1920-29, all but 10,000 acres had restocked by 1941--approximately a 15 percent failure to restock. Of the 14 western Washington and 6 western Oregon counties reinventoried to date, in only one county was a higher percentage of the lands logged in this decade restocked at time of reinventory.

However, when one studies table 3, which shows the area of immature conifer types by age class and degree of stocking, it is seen that a considerable portion of the stands are poorly stocked, especially those in the 10-year age class--stands that have restocked the lands cut during the decade 1920-29. Although the areas in this table include stands both on cut-over and burned-over lands, the percentage in each of the stocking classes is approximately the same in stands of both origins. Stands of the older age classes in which the trees are of pole size (6 - 20 inches d.b.h.) average considerably higher in degree of stocking than those of seedling and sapling size (less than 6 inches d.b.h.). The weighted average stocking, in terms of normality (100 percent), of the pole stands is 69 percent as against 53 percent for the seedling and sapling stands.

Since logging operations in the past have been concentrated principally in stands in which Douglas-fir predominated, it would be expected that this species predominates in most of the stands on cut-over land and such is the case. Douglas-fir types (8, 9, and 10) cover 131,000 acres, or 78 percent of the restocked area; western hemlock type has restocked the major portion of the remaining area.

A total of 106,000 acres of second-growth conifers less than sawtimber size, or 45 percent of the total area, is now in private ownership; 85,000 acres is restocked with Douglas-fir types. The State of Washington through original grants and acquisitions has a total of 53,000 acres, nearly two-thirds of which is stocked with Douglas-fir types. The county through tax foreclosure has acquired 34,000 acres, which it is to be hoped will be placed in stable ownership. Federally owned second-growth stands total 36,000 acres.

Hardwood forests limited. Most of the original hardwood forests in the county, which were limited chiefly to the bottom lands along the Skagit River and tributary Sauk River, have undergone considerable change.

Table 3. - Area, in acres, of certain immature conifer forest types, by age class and degree of stocking
Data corrected to September 1, 1941

Age class (years)	Degree of stocking	Type number and name: 10 Douglas-fir seedlings and saplings	16 Western hemlock seedlings and saplings	9 Douglas-fir small second growth	15 Western hemlock small second growth	19 Western redcedar second growth	24 1/ Fir-mountain hemlock second growth	Total
10	Good	6,390	2,345			150	35	8,920
	Medium	9,620	8,770			665	1,045	20,100
	Poor	19,180	7,825			210		27,215
	Total	35,190	18,940			1,025	1,080	56,235
20	Good	15,055	5,205	380		1,245	150	22,035
	Medium	27,490	4,740			2,350	235	34,815
	Poor	12,675	760			165	595	14,195
	Total	55,220	10,705	380		3,760	980	71,045
30	Good	280		13,095	200	465	70	14,110
	Medium	2,505		7,860	805	75	110	11,355
	Poor			1,920		115		2,035
	Total	2,785		22,875	1,005	655	180	27,500
40	Good			10,540	1,980	260	165	12,945
	Medium			6,860	740	110		7,710
	Poor			380				380
	Total			17,780	2,720	370	165	21,035
50	Good			9,475	565	165	105	10,310
	Medium			15,090	250	45	65	15,450
	Poor			85				85
	Total			24,650	815	210	170	25,845
60	Good			1,355	420			1,775
	Medium			1,615	80			1,695
	Poor			980				980
	Total			3,950	500			4,450
70	Good			5,135	75		730	5,940
	Medium			6,880	2,400		175	9,455
	Poor			115	270			385
	Total			12,130	2,745		905	15,780
80	Good			1,690	325		85	2,100
	Medium			1,465	1,870			3,335
	Poor			490	410			900
	Total			3,645	2,605		85	6,335
90+	Good			980	1,095	175	255	2,505
	Medium			10	2,820	60	310	3,200
	Poor			395				395
	Total			1,385	3,915	235	565	6,100
Total all ages	Good	21,725	7,550	42,650	4,660	2,460	1,595	80,640
	Medium	39,615	13,510	39,780	8,965	3,305	1,940	107,115
	Poor	31,855	8,585	4,365	680	490	595	46,570
	Total	93,195	29,645	86,795	14,305	6,255	4,130	234,325

1/ Includes 435 acres type 30, grand fir second growth.

Northern black cottonwood occurred in heavy stands, usually pure in composition, on the fertile river islands formed by the Skagit River, which during periods of high water overflowed and frequently changed its course. Many of these stands have been cut for pulpwood or furniture logs. Red alder stands which occurred on some of the bottom lands and also extended for a short distance up the lower slopes have been cut extensively for furniture logs. Stands of this species frequently contained bigleaf maple and occasionally Oregon ash. Alder and maple were also found as understory trees over a considerable acreage of the conifer stands. At present hardwood stands cover 47,000 acres, on 20,000 acres of which the trees are of merchantable size (12 inches and more d.b.h.). Eighty percent of the hardwood acreage is in private ownership.

Area of noncommercial forests large. The subalpine forests, inferior stands on sterile sites, and lodgepole pine timber of small size, all classed as noncommercial in the forest survey, have been practically undisturbed by white settlement. Fires, most of which occurred years ago, have swept over a considerable acreage of these types. The noncommercial forests occupy 174,000 acres, more than 92 percent of which is in national forest ownership. They are extremely valuable in protecting the surface of watersheds in preventing rapid run-off and melting of snow. They are also a most important part of the scenic beauty of the high mountainous portions of the county.

Productive capacity of forest land fairly high. In an analysis of the forest resource of the county, consideration should be given to the forest land itself since it is basic. Along with such other physical factors as rainfall, temperature, altitude, degree of slope, aspect, and drainage, soil characteristics regulate the ability of any area to produce trees. All of the commercial forest land in the county was classified as to productivity or site quality. Results of this classification are given in table 4. Of the total of 382,000 acres classified according to ability to produce Douglas-fir and western redcedar timber, more than half is of class III, the average site in the Douglas-fir region. Most of the low-lying foothills and benches of the western portion of the county are of site class II. Areas included in the spruce-hemlock classification, totaling 281,000 acres, average considerably lower in productivity. The acreage in classes III and IV comprise 85 percent of the total.

Pulp species predominate in merchantable volume. Probably the most understandable measure of Skagit County's present forest resource is the merchantable board-foot volume contained in the old- and second-growth stands. The reinventory disclosed a total of 11.4 billion board feet, log scale, Scribner rule, of which 99 percent is in 11 conifer species and 1 percent is in 4 hardwood species. In table 5 this volume is shown by species and ownership class; the relative volume of each of the more important species is shown graphically in figure 3.

Table 4. - Land areas, forest land areas, and commercial conifer areas, by site quality class[1]
Data corrected to September 1, 1941

Kind of forest land and site quality class	Total area		Area in forest land	Area in commercial conifers
	Acres	Percent	Percent	Percent
Commercial conifer				
Douglas-fir				
Class I	3,056	0.3	0.3	0.5
Class II	111,938	10.1	12.7	16.9
Class III	199,807	18.0	22.6	30.1
Class IV	62,655	5.6	7.1	9.4
Class V	4,584	0.4	0.5	0.7
Total	382,040	34.4	43.2	57.6
Spruce-hemlock				
Class I	65	-	-	-
Class II	29,809	2.7	3.3	4.5
Class III	117,269	10.6	13.3	17.7
Class IV	121,141	10.9	13.7	18.3
Class V	12,936	1.2	1.5	1.9
Total	281,220	25.4	31.8	42.4
Total commercial conifer	663,260	59.8	75.0	100.0
Lodgepole pine	1,450	0.1	0.2	
Subalpine	152,145	13.8	17.2	
Noncommercial rocky	20,045	1.8	2.3	
Hardwood	46,780	4.2	5.3	
Total other	220,420	19.9	25.0	
All forest land	883,680	79.7	100.0	
Nonforest land	224,625	20.3		
Grand total	1,108,305	100.0		

1/ The "site quality" of a forest area is its relative productive capacity, determined by climatic, soil, topographic, and other factors. The index of site quality is the average height of the dominant stand at the age of 100 years. Five site quality classes are recognized for both Douglas-fir and spruce-hemlock types, Class I being the highest. In the survey, Douglas-fir classifications were used for Douglas-fir and western red-cedar types; spruce-hemlock classifications were used for Sitka spruce, western hemlock, and fir-mountain hemlock types.

Table 5. - Volume of timber by species and ownership class
Data corrected to September 1, 1941

Trees 16" and more d.b.h.[1/]
Thousands of board feet, log scale, Scribner rule

Species	Private	State		County	Municipal	Indian	Federal, available		Total
		Available	Reserved				National forest	Public domain	
Douglas-fir									
Large old growth	596,572	71,509	8,360	13,943	14,099	5,265	263,518	1,141	974,407
Small old growth	158,942	20,810	1,562	7,300	3,148	2,072	248,909	194	442,937
Large second growth	408,271	128,181	4,641	51,314	924	18,585	92,028	1,280	705,224
Small second growth	173,030	23,601	472	7,657	610	7,059	108,114	1,689	322,232
Sitka spruce, large	7,854	1,492					508		9,854
Engelmann spruce							16,847		16,847
Western hemlock									
Large	1,523,089	393,314	384	47,126	257	2,811	1,839,683	1,272	3,807,936
Small	389,905	107,948	57	13,741		805	31,150	6,016	549,622
Mountain hemlock	519	86		25			42,155		42,785
Western redcedar									
Live	707,423	191,399	620	17,122	342	4,452	656,086	523	1,577,967
Dead	63,774	9,203		3,270		2	37,647	145	114,041
Alaska yellow-cedar	57	22		20			10,321		10,420
Western white pine	18,396	1,098		123	6	155	35,239	130	55,147
Pacific silver fir	903,117	225,307		34,998	18	818	1,445,965	510	2,610,733
Grand fir	3,047	4					1,453		4,504
Alpine fir							16,437		16,437
Red alder	31,493	1,788	15	1,504	41	2,637	1,252	4	38,734
Bigleaf maple	14,939	2,016	36	788	93	350	2,272	9	20,503
Black cottonwood	40,973	685	20	2,140		1,790	625		46,233
Oregon ash	1,012								1,012
Total	5,042,413	1,178,463	16,167	201,071	19,538	46,801	4,850,209	12,913	11,367,575

1/ Trees of hardwood species taken from 12" and more d.b.h.

Remaining volume of Douglas-fir, at present the county's most highly valued species, is approximately 2.4 billion feet or 22 percent of the total conifer volume. Volume of large old-growth fir is slightly less than 1 billion feet. Nearly two-fifths of the total volume is western hemlock and nearly one-fourth is Pacific silver fir. Together the volume of these two species--8 billion feet--constitutes a large supply of pulpwood.

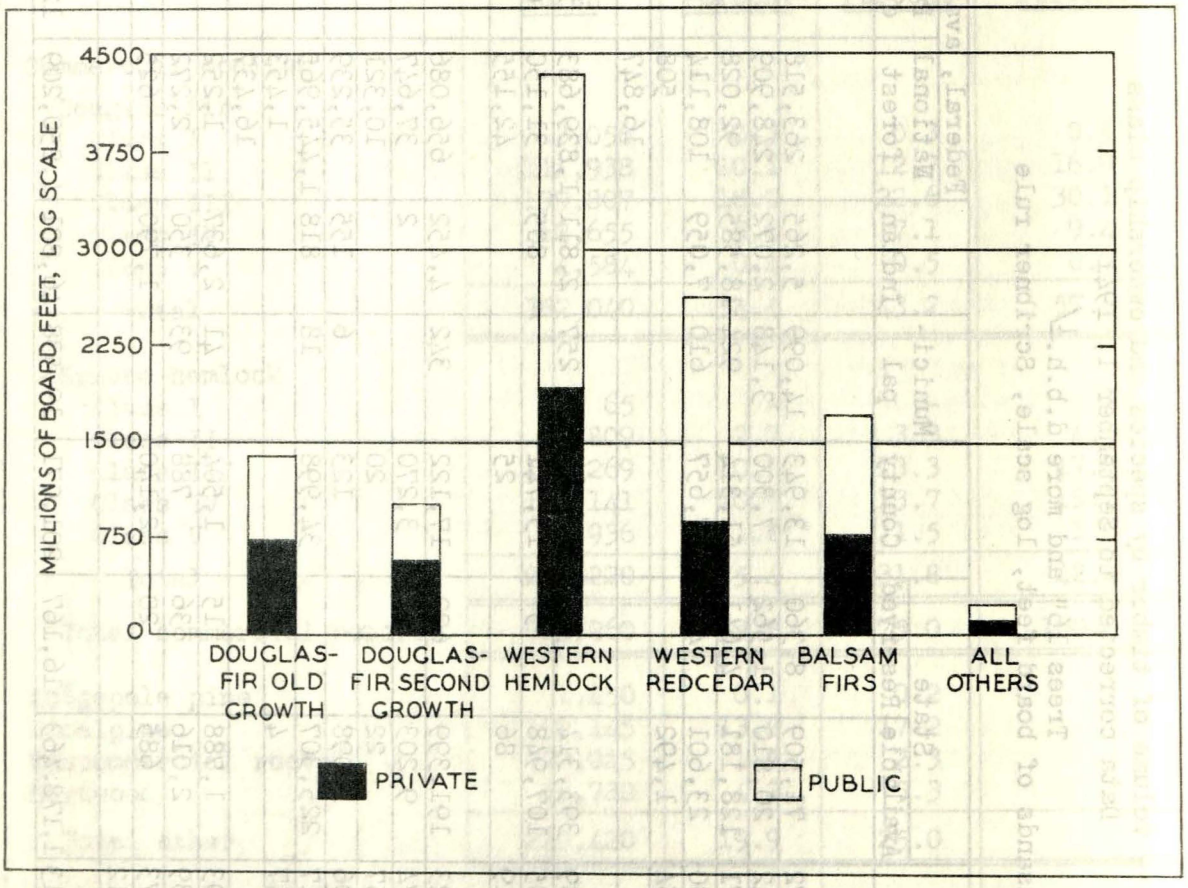

Figure 3. Distribution of saw-timber volume by species group (from table 5).

Privately owned volume totals 5 billion feet of which one and a third billion feet is Douglas-fir. The volume in federal ownership is only slightly less, 4.9 billion feet, but volume of federally owned Douglas-fir is only a little more than half that in private ownership.

Inventories compared. It is of interest to compare the extent, character, and ownership of the county's present forests with those of a decade ago, 1932, when the original inventory was made. A comparison of some of the statistics obtained in the two inventories follows:

	1932 inventory	1941 inventory	Change
Forest land area	883 M acres	884 M acres	0.01%
Privately owned forest land	416 M acres	336 M acres	-19%
Saw-timber stands	388 M acres	353 M acres	- 9%
Privately owned saw timber	172 M acres	126 M acres	-27%
Conifer second growth 6-20" d.b.h.	97 M acres	104 M acres	7%
Conifer second growth 0-6" d.b.h.	73 M acres	131 M acres	79%
Saw-timber volume	13,003 million bd. ft.	11,368 million bd. ft.	-13%
Douglas-fir volume all sizes	3,092 million bd. ft.	2,445 million bd. ft.	-21%
Douglas-fir volume large old growth	1,572 million bd. ft.	974 million bd. ft.	-38%
Privately owned saw-timber volume	7,142 million bd. ft.	5,042 million bd. ft.	-29%

This comparison especially emphasizes the rapid rate at which the Douglas-fir timber has been cut, the concentration of cutting in privately owned timber, the trend from private to public ownership of forest land resulting from reversion of private land to county ownership through tax foreclosure, and an encouraging rate at which the cut-over lands are restocking.

The Future Forests

In speculating on what the future forests of Skagit County will be like and the sustained volume of timber that they may be able to yield, it might be well to trace the trend of their utilization, estimate the rate of their replacement through growth, and consider the capacity and raw-material requirements of the wood-using industries in the county.

Peak of cutting depletion reached. The rate at which the virgin forests have been harvested increased gradually from the first cutting soon after the middle of the last century until the late 1920's. There were periods both of depressed and increased activity but in general the trend was upward. Timber was cut as sawlogs, fuelwood, piling,

shingle bolts, poles, posts, and pulpwood, but the vast bulk of the volume was in the form of sawlogs. Statistics on sawlog production in the county are not available for the years prior to 1925 but there is sufficient information to indicate that beginning about 1917 there was a large expansion in the logging industry both in number and size of operations. Peak of activity was reached in 1928 when approximately 427 million board feet of sawlogs was cut in the county, a production that probably will never again be reached. Average annual cut for the period 1925-29 was 386 million feet. In addition during this 5-year period it is estimated an average volume of 17 million board feet was cut annually from trees of saw-timber size as pulpwood, fuelwood, shingle bolts, veneer blocks, and posts, and 4 million cubic feet, solid wood, was cut from trees less than saw-timber size in the form of pulpwood, fuelwood, poles, piling, and posts. During the 5-year period 1930-34 depressed economic conditions caused a huge reduction in sawlog production and the average annual output was but 80 million feet. Improved conditions during the next 5 years, 1935-39, resulted in an average output of 189 million feet. Further increase was noted in 1940 and 1941 and due to the greatly expanded demand for logs the cut in 1942 will probably be near 300 million feet. An additional 25 to 30 million feet will probably be cut from saw-timber stands for products other than sawlogs. Thus the volume of current cutting depletion is near a third of a billion board feet. But how long this rate will prevail is highly problematical.

Fire loss nominal. Measurable depletion of the forests in the last two decades due to fire has not been large. Analysis of records of fires that occurred in forests in the portion of the county outside the national forest during the period 1924-30 shows an average of 4,500 acres burned over and 1.2 million board feet of merchantable timber killed and not salvaged annually. During nearly the same period, 1924-31, fires on the national forest burned over annually an average of 600 acres and killed less than 1 million feet of merchantable timber. Combined, these averages amount to about 5,000 acres burned over and slightly more than 2 million feet of timber killed annually. As in the case of depletion due to cutting, the average annual drain due to fire over a given period of years cannot be used as a guide in estimating future depletion. It is more difficult to predict annual fire drain since a single large fire could cause a far greater loss than all the fires that have occurred in the county over a long period of years.

Depletion due to abnormal forest insect activities, wind throw, and diseases have been insignificant.

Current growth less than depletion. Depletion of the county's forest resource through cutting and fire is offset in part by forest growth. As part of the forest survey, the average annual net growth of the forests was calculated. It was assumed that net volume growth in stands from about 160 to 300 years old is offset by net volume loss in older stands; therefore, net volume growth was computed only on stands

less than 160 years old. In the reinventory, stands less than this age were found to occupy approximately 284,000 acres of commercial conifer forest land. The current annual net growth in these stands in trees 15.1 inches and more d.b.h. was computed to be 56 million board feet. Calculations of the net annual cubic-foot growth in all trees 5.1 inches and more d.b.h. were also made. This was found to total 23 million cubic feet. The net annual hardwood growth was computed to be approximately 2 million board feet.

A current net board-foot growth of 56 million board feet compared to a current cut in the neighborhood of 300 million feet seems a long way from sustained yield. If such a ratio were to prevail, the end of the county's accessible merchantable timber volume would be in sight. However, it is probable that several factors will act to reduce this wide disparity between cut and growth. The first, and no doubt the most important, factor will be a reduction in the volume of timber cut annually. After the war, demand for logs may drop off materially. Also, the timber in federal ownership, and probably that owned by the State, will be cut under sustained-yield management which will tend to bring the cut down gradually towards the productive capacity of the forests. Secondly, the present accessible mature and overmature stands constitute a backlog which could provide sawlogs for several decades. And as these stands--now stagnant as far as net growth is concerned--are cut the land can if properly managed be made productive. Thirdly, understocked second-growth stands tend to become better stocked with increase in age and to approach normal stands. Accordingly, a natural improvement in the stocking of the present poorly stocked stands, principally of the younger age classes, will increase the net growth rate. Also, under more intensive management, improvement cutting will probably be made in any overstocked stands which will yield piling, poles, pulpwood, and fuelwood and at the same time leave a stand with a greater net growth rate. In order for these factors to be the most fruitful in improving the present situation, certain good forestry practices are essential. Among these are adequate fire protection for all forest lands, cutting of old-growth stands in such a manner as to prevent creation of large areas of cut-over land without adequate seed supply, planting of nonrestocked areas where no seed source is available, and reservation of second-growth stands from all premature cutting other than thinnings. All of these practices are economically feasible here.

Large volume of logs shipped out of county. Total installed capacity of the wood-using industries in Skagit County is considerably smaller than in most of the counties bordering on Puget Sound. A large volume of sawlogs cut here has gone out of the county to be milled. The 11 mills which operated in the county in 1941 and, according to statistics compiled by the Bureau of the Census in cooperation with the Forest Service, cut a total of 80 million board feet of lumber consumed a volume of logs only about one-fourth as large as the total volume of logs produced in the county during the year. Also, some of the logs milled in the county were imported from the log markets of Puget Sound.

Anacortes, located on Fidalgo Island and with deep-water transportation, has always been the center of the county's wood-using industry. Here are located three sawmills with approximately four-fifths of the total installed capacity, one 80-ton pulp plant, several shingle mills, box factories, and wood-working plants. Sedro Woolley has been the center of plants cutting hardwoods for furniture stock and also headquarters for some of the larger logging operations. Some two dozen logging companies operated in the county in 1941, a third of which could be classed as large operations with more than one side.

The present established units of the wood-using industry in the county are adequate to utilize the volume of raw material that should be cut under any plan that looks toward eventual sustained-yield management of the forest resource and further installations should be discouraged.

If given planned, intelligent management, the county's forests even in their somewhat depleted condition can continue to maintain, along with the products of the rich agricultural lands and the industries based on utilization of other resources, a diversified economy which will be, in good times and bad, much more stable than one based chiefly on the utilization of only one natural resource.